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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/726,744 | 12/02/2003 | Larry C. Olsen | 23-65037-01 | 6833 |
| 32215 7590 03/03/2010 KLARQUIST SPARKMAN, LLP 121 SW SALMON STREET, SUITE 1600 ONE WORLD TRADE CENTER PORTLAND, OR 97204 | | | | |
| EXAMINER BARTON, JEFFREY THOMAS | | | | |
| ART UNIT | | PAPER NUMBER | | |
| 1795 | | | | |
| NOTIFICATION DATE | | DELIVERY MODE | | |
| 03/03/2010 | | ELECTRONIC | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/726,744

Applicant(s)

OLSEN ET AL.

Examiner

Jeffrey T. Barton

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5-18, 23-25 and 37-39 is/are pending in the application.
- 4a) Of the above claim(s) 2 and 23-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 5-18 and 37-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-506)
Paper No(s)/Mail Date See Continuation Sheet
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ ~~Notice of Informal Patent Application~~
- 6) ☐ Other: _____

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :20100201, 20091201, 20091201, 20091014, 20090826, 20090713.

DETAILED ACTION

Election/Restrictions

1. The amendment filed on 1 December 2009 amends claim 1 such that it again corresponds to the invention Applicant elected without traverse. (Restriction presented in Office Action of 13 April 2009, with election confirmed in Applicant's response of 13 July 2009) Accordingly, claims 1, 3, and 5-18 are examined herein. Applicant's argument that claim 37 remained "essentially in the same form" as presented previously is not persuasive, since the claim had been amended such that it no longer corresponded to the elected invention, namely thermoelectric power sources having co-sputtered and/or nonstoichiometric compound thermoelements. However, since only limitations that are present in the elected claims are currently present in claims 37-39, no particular burden is currently present in examining claims 37-39 with the elected claims, and these claims are therefore rejoined. Claims 2 and 23-25 stand withdrawn from consideration as being drawn to nonelected inventions.

Status of Rejections Made in the Office Action of 13 April 2009

2. The previous rejections made under 35 U.S.C. §112, first and second paragraph are withdrawn due to removal of unsupported and unclear language, "greater than in incidental amount". The specification, particularly at Page 10, lines 6-10, is considered to provide adequate support for the limitation to a non-stoichiometric compound.
3. The previous rejections made under 35 U.S.C. §103(a) are maintained.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 3, 5-10, 12-15, 17, 18, and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migowski (WO 89/07836; references below are made to the

English translation of this document provided by Applicant) in view of Böttner. (21st Int'l Conf. on Thermoelectronics reference)

Regarding claims 1 and 37, Migowski discloses a thermoelectric power source comprising a flexible substrate having an upper surface (Page 3, 1st full paragraph); a plurality of thermoelectric couples, with the thermoelectric couples comprising: sputtered thin film p- and n-type thermoelements (1 and 2) as claimed (Paragraph bridging pages 2 and 3; Page 3, 1st full paragraph; Page 4, paragraph beginning with "Figure 1a . . .") and an electrically conductive member (3) positioned on the flexible substrate and connecting the p- and n-type thermoelements as claimed (Figure 2; Page 4, paragraph beginning with "Figure 1a . . ."); and wherein the thermoelectric couples are formed on a single substrate and rolled into a coil configuration. (Paragraph bridging pages 2 and 3)

Regarding claims 5 and 6, Migowski teaches 7500 thermocouples on a substrate, which produces 11 microwatts at 1.6V. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claims 13 and 39, Migowski teaches rolling a 30 cm long polyimide film (Paragraph bridging pages 2 and 3) having thermocouples with exemplary dimension of about 0.75 mm wide (Page 4, paragraph beginning with "Layer thickness: . . ." in conjunction with orientation of figure 2) Such a rolled-up device will clearly have volume less than 10 cm^3 . Migowski further teaches outputs of about 11 microwatts. (Page 4, paragraph beginning with "Layer thickness: . . .")

Regarding claim 15, Migowski teaches power output with a temperature difference of 6 °C. (Page 4, paragraph beginning with "Layer thickness: . . .")

Although Migowski suggests forming the thermocouples from known materials, including Bi, Sb, and Te (Page 3, 3rd full paragraph), he does not explicitly teach non-stoichiometric or co-sputtered compounds as claimed.

Böttner is cited as teaching co-sputtered non-stoichiometric thin films of n- and p-type bismuth/antimony telluride compounds as thermoelectric material used in forming thermocouples on a substrate. (Figures 11a and 11b, for example; "Growth of Thermoelectric Materials" section on page 514)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Migowski by specifically selecting the thin film bismuth/antimony tellurides or superlattice $(\text{Bi,Sb})_2\text{Te}_3/\text{Sb}_2\text{Te}_3$ as the thermoelectric materials, as taught by Böttner, because Migowski suggests forming the thermocouples from bismuth, antimony and tellurium, and Böttner demonstrates the effectiveness of these materials as thermoelectric materials. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Regarding claims 3 and 17, Böttner suggests bismuth selenide materials for the thermoelectric devices (Conclusions and Growth of Thermoelectric Materials sections) in addition to the bismuth and antimony tellurides, and such choice of multiple known thermoelectric materials for the device would have been obvious to one having ordinary skill in the art. Note again that the selection of a known material based on its suitability

for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Further regarding claims 7-10, 14, and 38, the choice of a specific volume for the device, number of couples, and resulting power output are dependent on the specific application for the device. The specific wiring methods, series or parallel, also affects the power/current outputs for the device and are well known within the art to alter the wiring to meet the specific requirements of an application. Absent any unexpected results, it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose a specific volume, wiring method and output power as within the claims for the device of Migowski. The choice of element length, width, and thickness is known in the art to affect the power output available from a thin film thermocouple device, and is therefore considered to also be a design choice that is obvious to one skilled in the art, absent any evidence of criticality or unexpected results. Therefore these claims are also obvious over the combination of art described above.

Regarding claims 12 and 18, Böttner teaches n- and p-type films comprising bismuth telluride and antimony telluride as claimed. (e.g. Figures 11a and 11b)

8. Claims 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Migowski and Böttner as applied to claims 1, 3, 5-10, 12-15, 17, 18, and 37-39 above, and further in view of Bass et al. (US 6,207,887)

Migowski and Böttner are relied upon for the reasons given above.

Neither Migowski nor Böttner explicitly discloses a device with pluralities of thermoelements connected in series and parallel precisely as claimed.

Bass et al disclose a series-parallel connection scheme for a thermoelectric generator (Figure 13A; Column 6, lines 46-62) in which plural n-type elements are connected electrically in parallel and are connected in series to a plurality of p-type elements that are connected to each other in parallel.

It would have been obvious to one having ordinary skill in the art to further modify the device of Migowski by employing the series-parallel connection scheme of Bass et al, because Bass et al teach that such connection protects against complete power loss in the event of damage to a single thermoelement, thus providing increased reliability. (Column 6, lines 46-62)

Response to Arguments

9. Applicant's arguments filed 1 December 2009 have been fully considered but they are not persuasive as they pertain to the rejections relying upon Migowski in view of Böttner.

Applicant argues that Böttner does not enable preparation of the compounds for which the reference is relied upon for teaching. This is not persuasive because Böttner teaches co-sputtering of the instant nonstoichiometric materials (Pages 514-516, for example, teach this in detail) The reference teaches simultaneous sputtering using elemental targets of bismuth, antimony, and tellurium. This will lead to cosputtered nonstoichiometric materials as claimed. There is no reason to believe that one skilled in

the sputtering arts would not be able to prepare cosputtered bismuth antimony telluride thermoelectric materials based on this clear teaching of the reference.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571)272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571) 272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.